

PATENT COOPERATION TREATY
PCT
INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference 11515PC2	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).	
International Application No. PCT/AU2003/001549	International Filing Date (day/month/year) 19 November 2003	Priority Date (day/month/year) 19 November 2002
International Patent Classification (IPC) or national classification and IPC Int. Cl. ⁷ C02F 1/46, C25B 15/02		
Applicant AQUENOX PTY LTD et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 6 sheet(s).

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 11 June 2004	Date of completion of the report 20 January 2005
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer M.R. OLLEY Telephone No. (02) 6283 2143

I. Basis of the report**1. With regard to the elements of the international application:***

- ☐ the international application as originally filed.
- ☒ the description, pages 1,5-13, as originally filed,
pages , filed with the demand,
pages 2-4, received on 2 December 2004 with the letter of 2 December 2004
- ☒ the claims, pages , as originally filed,
pages , as amended (together with any statement) under Article 19,
pages , filed with the demand,
pages 14-16, received on 2 December 2004 with the letter of 2 December 2004
- ☒ the drawings, pages 1-10, as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims 1-12	YES
	Claims	NO
Inventive step (IS)	Claims 1-12	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-12	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)

P 2001310188A =D1

JP 10165957A = D2

WO 2002/044092A=D3

WO 1999/043617A=D4

EP 1036653A=D5

US 3974070A=D6

US 3969203A=D7

US 6358398A=D8

AU 707432A=D9

WO 1994/000860A=D10

The documents above do not disclose all the features of the claims of the application, specifically there is no disclosure of the busbar being arranged normal to the top edges of respective electrodes and no disclosure of a tab extending from the top edge of each electrode having a notch. Therefore the claims of the application are novel and have an inventive step.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/AU2003/001549

VI. Certain documents cited**1. Certain published documents (Rule 70.10)**

Application No. Patent No.	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
US 2002/0185446	12 December 2002	12 June 2001	12 June 2001
US 655143	22 April 2003	18 October 2003	20 October 2000

2. Non-written disclosures (Rule 70.9)

Kind of non-written disclosure	Date of non-written disclosure (day/month/year)	Date of written disclosure referring to non-written disclosure (day/month/year)
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salt. A plurality of bipolar electrode plates is mounted in the cell with only a select number of electrodes being connectable to a power supply.

Yet another system is described in WO 94/00860 where an electrolytic filter has electrically configurable connections to active electrodes in an electrolytic cell. A sensor senses a resistivity variation in the electrolytic solution and a control circuit varies the current flow by adjusting the separation between electrodes using relay contact switches for electrically connecting or disconnecting each active electrode.

A major drawback of the above systems is they are designed for a specific electrolyte or liquid which is to be treated. The electrodes used, their quantity and desired power requirements are specific to the liquid being treated.

A further drawback of conventional electrocoagulation systems is the high cost associated with designing a system for each specific application. Substantial testing and modification is required where the liquid stream changes in its concentration of contaminants.

Object of the invention

It is an object of the invention to provide an improved electrocoagulation system.

It is a further object of the invention to provide an improved control assembly for an electrocoagulation cell that facilitates treatment of various liquids or species.

Summary of the invention

In one form, although it need not be the only or indeed the broadest form, the invention in a first aspect resides in a control assembly for an electrocoagulation cell comprising:

- (i) a plurality of electrodes;
- (ii) releasable connection means between at least a selection of

the electrodes comprising an elongate busbar which is arranged normal to respective top edges of each electrode in plan view and which extends through a notch, slot or aperture located in individual tabs which each extend upwardly from an adjacent top edge of each electrode whereby the busbar is spaced from the top edges of each electrode so as to avoid contact with liquid contained in the electrocoagulation cell in use as well as a plurality of fasteners attached to said busbar whereby each fastener abuts or is located closely adjacent to an adjoining surface of each electrode; and

- (iii) electrical connection means attached to the busbar at each end thereof which in use is connectable to a power supply.

The releasable connection means may facilitate the number of electrodes releasably connected to be varied according to specific requirements for treating a particular electrolyte.

The electrodes may be connected in a series arrangement.

The electrocoagulation cell can treat the electrolyte at a rate of 1 Litre per minute or 5 Litres per minute or 10 Litres per minute or 100 Litres per minute or 500 Litres per minute (LPM).

In a second aspect of the invention there is provided an electrocoagulation system comprising:

- (i) a controller that is selectable for providing both a constant output current and/or a constant output voltage whereby the electrolytic cell may process samples of varying characteristics;
- (ii) a voltage regulator;
- (iii) a transformer having a primary coil connected to the voltage regulator;

- (iv) a rectifier connected to a secondary coil of the transformer;
and
- (v) a voltage or current regulator which receives an output from
the rectifier and together with said controller effects a firing
control of the voltage regulator.

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The electrocoagulation system of the second aspect may also include a programmable logic control (PLC) for checking parameters associated with the flow of an electrolyte to and through the cell.

There also may be provided flow control means for delivering the
10 electrolyte to the electrocoagulation cell.

In a preferred form of the invention, the flow control means includes a digital controller, variable AC motor drive, feed pump with pump motor and a flow transmitter.

The power supply of the second aspect may be connected to a three
15 phase AC power source.

Preferably, the constant output current and the constant output voltage is a direct current (DC).

Preferably, if a constant output current is selected, then the DC current is maintained constant with respect to a reference set by the control
20 means and the DC voltage may vary.

Preferably, if a constant output voltage is selected, then the DC voltage is maintained constant with respect to a reference set by the control means and the DC current may vary.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A control assembly for an electrocoagulation cell comprising:
 - a. a plurality of electrodes;
 - b. releasable connection means between at least a selection of
5 the electrodes comprising an elongate busbar which is arranged normal to respective top edges of each electrode in plan view and which extends through a notch, slot or aperture located in individual tabs which each extend upwardly from an adjacent top edge of each electrode whereby the busbar is
10 spaced from the top edges of each electrode so as to avoid contact with liquid contained in the electrocoagulation cell in use as well as a plurality of fasteners attached to said busbar whereby each fastener abuts or is located closely adjacent to an adjoining surface of each electrode; and
15 c. electrical connection means attached to the busbar at each end thereof which in use is connectable to a power supply.
2. A control assembly as claimed in claim 1 wherein the busbar is threaded and the plurality of fasteners comprise one or more threaded nuts each having an associated washer.
- 20 3. A control assembly as claimed in any preceding claim wherein the electrical connection means comprises a power lead secured to an electrical connector having an aperture for engaging with an adjacent end of the busbar.
4. A control assembly as claimed in claim 3 wherein each electrical

connector is attached to the busbar with a fastener on either side of the connector.

5. An electrocoagulation system comprising:
- a. a controller that is selectable for providing both a constant output current and/or a constant output voltage whereby the electrolytic cell may process samples of varying characteristics;
 - b. a voltage regulator;
 - c. a transformer having a primary coil connected to the voltage regulator;
 - d. a rectifier connected to a secondary coil of the transformer; and
 - e. a voltage or current regulator which receives an output from the rectifier and together with said controller effects a firing control of the voltage regulator.
6. An electrocoagulation system as claimed in claim 5 wherein the control means in a voltage and current potentiometer.
7. An electrocoagulation system as claimed in claim 6 wherein the potentiometer is set for a constant output DC current thereby allowing the power supply to provide a variable output DC voltage.
8. An electrocoagulation system as claimed in claim 6 wherein the potentiometer is set for a constant output DC voltage thereby allowing the power supply to provide a variable output DC current.
9. An electrocoagulation system as claimed in any one of claims 5-8 which has an adjustable switch connectable to the power source and which is also connected to the voltage regulator.
10. An electrocoagulation system as claimed in claim 5 which further includes a polarity switch relay to select an output polarity.
11. An electrocoagulation system as claimed in any one of claims 5 to 10 which further includes a current trip for protection against exceeding a maximum DC amperage rating of the power supply.
12. An electrocoagulation system as claimed in any one of claims 5 to 11

which further includes an over temperature relay to sense any overheating in the rectifier.